



PATENT APPLICATION

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of

Takamitsu ASANUMA et al.

Application No.: 10/829,160

Examiner: T. NGUYEN

Filed: June 3, 2004

Docket No.: 110108.01

For: DEVICE FOR PURIFYING THE EXHAUST GAS OF AN INTERNAL  
COMBUSTION ENGINE

BRIEF ON APPEAL

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Appeal from Group 3748

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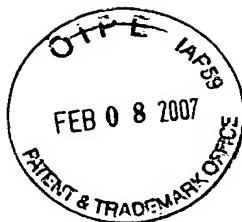


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Application No. 10/829,160

**I. REAL PARTY IN INTEREST**

The real party in interest for this appeal and the present application is Toyota Jidosha Kabushiki Kaisha, by way of an Assignment recorded in the U.S. Patent and Trademark Office at Reel 012001, Frame 0685.

**II. RELATED APPEALS AND INTERFERENCES**

There are no prior or pending appeals, interferences, or judicial proceedings, known to Appellant, Appellant's representative, or the Assignee, that may be related to, or that will directly affect or be directly affected by or have a bearing upon, the Board's decision in the pending appeal.

**III. STATUS OF CLAIMS**

Claims 1 and 4-6 are on appeal.

Claims 1 and 4-6 are pending.

No claims are allowed, and no claims are objected to only for being dependent from a rejected base claim, but are otherwise indicated to be allowable.

Claims 1 and 4-6 are rejected.

No claims are withdrawn from consideration.

Claims 2 and 3 are canceled.

**IV. STATUS OF AMENDMENTS**

No Amendment After Final Rejection has been filed.

**V. SUMMARY OF CLAIMED SUBJECT MATTER**

The invention of claim 1 is directed to a device for purifying the exhaust gas of an internal combustion engine. The device comprises: a particulate filter arranged in the exhaust system, wherein said particulate filter is a wall-flow particulate filter comprising a partition wall having pores, said partition wall carrying a catalyst for absorbing and reducing NO<sub>x</sub> on the exhaust gas upstream side surface thereof, said catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich (*see* page 2, lines 29–34); a catalytic apparatus for purifying NO<sub>x</sub> arranged in the exhaust system upstream of said particulate filter, which catalytic apparatus carries a catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich (*see* page 2, lines 34–36 and page 28, lines 19–33); and control means for making the air-fuel ratio in said catalytic apparatus rich to release NO<sub>x</sub> from said catalyst of said catalytic apparatus to purify the released NO<sub>x</sub> by reduction, and making the air-fuel ratio in the particulate filter rich to release NO<sub>x</sub> from said catalyst of said particulate filter to purify the released NO<sub>x</sub> by reduction (*see* page 6, lines 14–37; page 40, line 19 to page 41, line 5) so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame (*see, e.g.,* page 26, line 35 to page 27, line 19).

The invention of claim 4 is directed to a device for purifying the exhaust gas of an internal combustion engine. The device comprises: a particulate filter arranged in the exhaust system, which carries a catalyst for absorbing and reducing NO<sub>x</sub>, said catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich (*see* page 2, lines 29–34); a catalytic apparatus for purifying NO<sub>x</sub> arranged in the exhaust system upstream of said



particulate filter, which catalytic apparatus carries a catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich (*see* page 2, lines 34–36 and page 28, lines 19–33); control means for making the air-fuel ratio in said catalytic apparatus rich to release NO<sub>x</sub> from said catalyst of said catalytic apparatus to purify the released NO<sub>x</sub> by reduction, and making the air-fuel ratio in the particulate filter rich to release NO<sub>x</sub> from said catalyst of said particulate filter to purify the released NO<sub>x</sub> by reduction (*see* page 6, lines 14–37; page 40, line 19 to page 41, line 5) so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame (*see, e.g.,* page 26, line 35 to page 27, line 19); and bypassing means to make possible the exhaust gas bypass said particulate filter downstream said catalytic apparatus (*see* page 21, line 15 to page 22, line 20; Figures 18–21).

The "control means" recited in claims 1 and 4 are described in the specification, for example, at page 6, lines 14–37. This section discloses an electronic control unit that is designated by reference numeral 30 in Figure 1. The electronic control unit is comprised, for example, of a digital computer and is provided with a ROM 32 and RAM 33, a CPU 34, an input port 35, and an output port 36, all connected with each other by a bidirectional bus 31.

The "bypassing means" recited in claim 4 are described in the specification, for example, at page 21, line 15 to page 22, line 20, and are depicted in Figures 18–22. Disclosed is a changeover portion 71 that comprises a valve body 71a, the changeover portion 71 communicated to a first connecting portion 72a of the particulate filter 70, a second connecting portion 72b of the particulate filter 70, and an exhaust passage 73. The valve body 71a has several different shut off positions, whereby it controls whether the exhaust gas flows through the particulate filter 70 or bypasses the particulate filter 70.

Upon reviewing the specification, one of ordinary skill in the art would understand that the phrase "oxidize and remove the particulates trapped on said particulate filter without producing luminous flame" distinguishes the claimed invention from particulate filters that ignite and burn the particulate matter in order to regenerate the filter. For example, the specification discusses particular matter that is not completely oxidized, and transforms into carbonaceous matter that is very difficult to oxidize. If a large amount of this material is allowed to ignite and burn at once, the excessive heat produced may melt the particulate filter. *See* page 36, line 35 to page 37, line 5. The specification also discusses another embodiment of the invention wherein the particulate filter does not carry a catalyst for absorbing and reducing NO<sub>x</sub>. In this embodiment, the trapped particulates on the particulate filter ignite and burn producing a luminous flame at a high temperature. The specification goes on to point out that because the particulate filter does not carry the catalyst for absorbing and reducing NO<sub>x</sub>, the catalyst is not deteriorated from a high temperature produced by a luminous flame. *See* page 42, lines 5–10.

**VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

The following grounds of rejection are presented for review:

1) Claims 4–6 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 2–4 of Application No. 09/904,875;

2) Claim 1 is rejected as having been obvious under 35 U.S.C. §103(a) over Japan Publication No. 6-117221 to Seto et al. ("Seto") in view of Japan Publication No. 6-159037 to Hirota et al. ("Hirota"); and

3) Claims 4–6 are rejected as having been obvious under 35 U.S.C. §103(a) over U.S. Patent Application Publication No. 2001/0035006 to Dou et al ("Dou") in view of Hirota.

## VII. ARGUMENT

Claims 4–6 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 2–4 of Application Number 09/904,875. Application Number 09/904,875 is abandoned thus rendering this rejection moot.

Claim 1 is rejected under 35 U.S.C. §103(a) over Seto in view of Hirota. Seto in view of Hirota does not teach or suggest the device of claim 1.

Claims 4–6 are rejected under 35 U.S.C. §103(a) over Dou in view of Hirota. Dou in view of Hirota does not teach or suggest the device of claims 4–6.

### A. The Obviousness-Type Double Patenting Rejection of Claims 4–6 Over Claims 2–4 of Application No. 09/904,875 is Moot

Application Number 09/904,875 is abandoned, rendering this rejection moot.

Accordingly, no further response to the rejection is required.

### B. Claim 1 Would Not Have Been Obvious Over Seto in View of Hirota

Claim 1 is an independent claim directed to a device for purifying the exhaust gas of an internal combustion engine. The device comprises:

a particulate filter arranged in the exhaust system, wherein said particulate filter is a wall-flow particulate filter comprising a partition wall having pores, said partition wall carrying a catalyst for absorbing and reducing NO<sub>x</sub> on the exhaust gas upstream side surface thereof, said catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich;

a catalytic apparatus for purifying NO<sub>x</sub> arranged in the exhaust system upstream of said particulate filter, which catalytic apparatus carries a catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich; and

control means for making the air-fuel ratio in said catalytic apparatus rich to release NO<sub>x</sub> from said catalyst of said catalytic apparatus to purify the released NO<sub>x</sub> by reduction, and making the air-fuel ratio in the particulate filter rich to release NO<sub>x</sub> from said catalyst of said particulate filter to purify the released NO<sub>x</sub> by reduction so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame.

Seto and Hirota, either separately or combined, fail to teach or suggest such a device.

### 1. Seto Does Not Teach or Suggest the Features of Claim 1

Seto is asserted to disclose a catalytic apparatus (17). *See* Seto at Figs. 1 and 9 and the Abstract. According to Seto, the apparatus includes two NO<sub>x</sub> absorbents, denoted reference numbers 17 and 20, where the NO<sub>x</sub> absorbent 17 is located upstream of the NO<sub>x</sub> absorbent 20. The downstream NO<sub>x</sub> absorbent 20 is provided to absorb NO<sub>x</sub> released by the NO<sub>x</sub> absorbent 17. Seto at Abstract. However, the broad generic disclosure of Seto does not disclose, and does not teach or suggest, that the catalytic apparatus is or should be a wall-flow particulate filter comprising a partition wall having pores, where the partition wall carries a catalyst on the exhaust gas upstream side surface thereof, as claimed. The cited disclosures of Seto do not teach or suggest that such a wall-flow particulate filter could or should be used in preference to any other type of catalytic apparatus, or that such a wall-flow particulate filter would provide any advantages.

Additionally, Seto also fails to teach or suggest the claimed “control means...so that said catalyst of said particulate filter also releases active-oxygen to *oxidize* and remove the particulates trapped on said particulate filter *without producing luminous flame*” (emphasis added).

**2. Hirota Does Not Overcome the Deficiencies of Seto**

Hirota is cited by the Examiner for the asserted disclosure that it is conventional in the art to use a particulate filter that carries an NOx absorber. The Examiner asserts that it would have been obvious to replace the NOx absorbent of Seto with the particulate filter of Hirota to reduce harmful soot emissions and save fuel. The Examiner also appears to assert that the particulate filter disclosed by Hirota inherently oxidizes the trapped soot without producing luminous flame.

**a. There is No Motivation to Substitute an NOx Absorbent Device of Seto with the Particulate Filter of Hirota**

Despite the Examiner's assertions, Hirota provides no teaching or suggestion that a particulate filter with an NOx absorber is equivalent to, or is a substitute for, an NOx absorbent device such as the device disclosed by Seto. Neither Seto nor Hirota teaches or suggests the interchangeability of their devices. Absent such teaching or suggestion, there fails to exist any motivation (other than Applicants' own disclosure) to substitute one of the NOx absorbent devices disclosed by Seto with the particulate filter with an NOx absorber as disclosed by Hirota.

Furthermore, neither Seto nor Hirota provide any motivation to preferentially select one of the NOx absorbent devices of Seto over the other for the asserted modification. Thus, neither Seto nor Hirota teach or suggest that the downstream NOx absorbent device of Seto, as opposed to the upstream NOx absorbent device of Seto, could or even should be replaced with the particulate filter of Hirota. Any such selection, combination, and modification is merely the result of the improper use of hindsight based on the present disclosure, and not the result of any motivation provided by the cited references.

b. **The Particulate Filter of Hirota Does Not Inherently Oxidize Trapped Soot Without Producing A Luminous Flame**

The Examiner states, "Hirota et al., however, fail to teach or suggest that the trapped soot is oxidized without producing a luminous flame." *See* May 2, 2006 Office Action, page 5, lines 8–9. However, in the following paragraph, the Examiner appears to assert that Hirota inherently teaches that the trapped soot is oxidized without producing luminous flame.

A quick read of the Abstract shows that Hirota actually teaches igniting and then burning the particulate matter collected on the particulate filter. As shown in the Abstract, the purpose of Hirota's disclosure is to reduce the energy necessary to ignite and burn the collected particulates. This is accomplished by feeding a fuel into the particulate filter as described in the Abstract. Because the particulate matter collected on the particulate filter is heated when NO<sub>x</sub> is discharged and reduced from the filter, the particulate matter ignites and burns easily when the fuel is added. *See* Abstract.

Despite the disclosure of Hirota, the Examiner asserts that the particulate filter disclosed by Hirota "is operated in an exact manner as that in the pending application to oxidize the trapped soot," and concludes that the allegedly similar functionality between Hirota and the pending application would lead "one with ordinary skill in the art to realize that the trapped soot in Hirota et al. is also oxidized without producing a luminous flame." *See* May 2, 2006 Office Action, page 5, lines 14–18.

The Examiner's reasoning is faulty for two reasons. First, Hirota's particulate filter is not operated in the exact manner as that described in the pending application nor is it even similar. The claimed embodiments of the instant invention are not described as having any means or mechanism for feeding fuel into the particular filter, whereas Hirota specifically describes feeding fuel into the particulate filter. Therefore, because the device disclosed by

Hirota operates in a very different manner as that described in the pending application, it cannot be said that Hirota's device inherently produces the same results.

Second, although the Examiner repeatedly characterizes Hirota as disclosing the *oxidation* of the particulate matter, Hirota does not actually use the word "oxidation." Instead, Hirota discloses *igniting* and *burning* the particulate matter. One skilled in the art would easily recognize that igniting and burning particulate matter would produce luminous flame. Not only does Hirota fail to teach or suggest removing the particulates trapped on a particulate filter without producing luminous flame, Hirota in fact specifically teaches away from the claimed invention by teaching exactly the opposite – igniting and burning the particulate matter more easily by adding fuel into the filter.

### 3. Conclusion

Seto does not teach or suggest all of the features of claim 1. Hirota fails to cure the deficiencies of Seto. Therefore, Seto and Hirota, considered either individually or in combination, fail to teach or suggest each and every feature of claim 1.

#### C. Claim 4–6 Would Not Have Been Obvious Over Dou in View of Hirota

Claim 4 is an independent claim directed to a device for purifying the exhaust gas of an internal combustion engine. The device comprises:

a particulate filter arranged in the exhaust system, which carries a catalyst for absorbing and reducing NO<sub>x</sub>, said catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich;

a catalytic apparatus for purifying NO<sub>x</sub> arranged in the exhaust system upstream of said particulate filter, which catalytic apparatus carries a catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is



lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich;

control means for making the air-fuel ratio in said catalytic apparatus rich to release NO<sub>x</sub> from said catalyst of said catalytic apparatus to purify the released NO<sub>x</sub> by reduction, and making the air-fuel ratio in the particulate filter rich to release NO<sub>x</sub> from said catalyst of said particulate filter to purify the released NO<sub>x</sub> by reduction so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame; and

bypassing means to make possible the exhaust gas bypass said particulate filter downstream said catalytic apparatus.

Dou and Hirota, either separately or combined, fail to teach or suggest such a device.

Because the disclosures of Seto and Dou are somewhat similar and Hirota is cited by the Examiner to cure the deficiencies of both Seto and Dou, it is believed that the arguments presented in regard to claim 1 equally apply to the rejection of claims 4–6 over Dou in view of Hirota.

#### **1. Dou Does Not Teach or Suggest the Features of Claim 4**

Dou is asserted to disclose an exhaust gas catalyst system. *See* Figures 16 and 17, and Abstract. According to Dou, the exhaust gas catalyst system depicted in Figure 16 comprises a sulfur trap 3 and an NO<sub>x</sub> adsorber 4. *See* paragraphs [0027] and [0063]. The sulfur trap is described as being located in a close coupled position with an internal combustion engine, and the NO<sub>x</sub> adsorber is described as being placed in an underfloor position. *See* paragraph [0027]. Figure 17 shows a more complex scheme for an exhaust gas catalyst system for a diesel engine, wherein the exhaust gas catalyst system depicted in Figure 16 further comprises a particulate trap 6 arranged upstream of the NO<sub>x</sub> adsorber. *See* paragraph [0028].

However, Dou does not disclose a particulate filter that carries a catalyst for absorbing and reducing NO<sub>x</sub>, or a “catalytic apparatus for purifying NO<sub>x</sub> arranged in the exhaust system upstream of said particulate filter” as claimed. Additionally, Dou fails to disclose the claimed “control means...so that said catalyst of said particulate filter also releases active-oxygen to *oxidize* and remove the particulates trapped on said particulate filter *without producing luminous flame*” (emphasis added).

**2. Hirota Does Not Overcome the Deficiencies of Dou**

Hirota is cited by the Examiner for the asserted disclosure that it is conventional in the art to use a particulate filter that carries an NO<sub>x</sub> absorber. The Examiner asserts that it would have been obvious to combine or replace the NO<sub>x</sub> absorber and particulate filter of Dou with the particulate filter of Hirota to reduce spacing in the device and to save fuel by inducing soot to combust at an earlier time. The Examiner also appears to assert that the particulate filter disclosed by Hirota inherently oxidizes the trapped soot without producing luminous flame.

**a. There is No Motivation to Combine the NO<sub>x</sub> Absorbent Device and Particulate Filter of Dou with the Particulate Filter of Hirota**

Despite the Examiner's assertions, Hirota provides no teaching or suggestion that a particulate filter with an NO<sub>x</sub> absorber is equivalent to, or is a substitute for, a separate particulate filter and a separate NO<sub>x</sub> absorber. Neither Dou nor Hirota teaches or suggests the interchangeability of their devices. Absent such teaching or suggestion, there fails to exist any motivation to combine or replace the NO<sub>x</sub> absorber and particulate filter of Dou with the particulate filter of Hirota.

**b.     The Particulate Filter of Hirota Does Not Inherently Oxidize Trapped Soot Without Producing A Luminous Flame**

For the reasons discussed above with regard to claim 1, the particulate trap disclosed by Hirota does not inherently oxidize trapped soot without producing luminous flame because 1) Hirota's particulate trap does not does not operate in the exact or even a similar manner as that of the particulate trap recited in claims 4–6, and 2) Hirota specifically teaches regenerating its particulate trap by igniting and burning the trapped particulate matter.

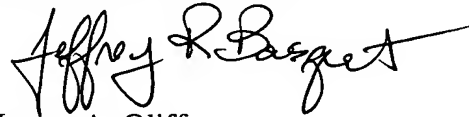
**3.     Conclusion**

Dou does not teach or suggest all of the features of claims 4–6. Hirota fails to cure the deficiencies of Dou. Therefore, Dou and Hirota, considered either individually or in combination, fail to teach or suggest each and every feature of claim 4–6.

**VIII. CONCLUSION**

For all of the reasons discussed above, it is respectfully submitted that the rejections are in error and that claims 1 and 4-6 are in condition for allowance. For all of the above reasons, Appellants respectfully request this Honorable Board to reverse the rejections of claims 1 and 4-6.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "James A. Oliff".

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**APPENDIX A - CLAIMS APPENDIX**

**CLAIMS INVOLVED IN THE APPEAL:**

1. A device for purifying the exhaust gas of an internal combustion engine comprising:

a particulate filter arranged in the exhaust system, wherein said particulate filter is a wall-flow particulate filter comprising a partition wall having pores, said partition wall carrying a catalyst for absorbing and reducing NO<sub>x</sub> on the exhaust gas upstream side surface thereof, said catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich;

a catalytic apparatus for purifying NO<sub>x</sub> arranged in the exhaust system upstream of said particulate filter, which catalytic apparatus carries a catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed NO<sub>x</sub> when said air-fuel ratio is stoichiometric or rich; and

control means for making the air-fuel ratio in said catalytic apparatus rich to release NO<sub>x</sub> from said catalyst of said catalytic apparatus to purify the released NO<sub>x</sub> by reduction, and making the air-fuel ratio in the particulate filter rich to release NO<sub>x</sub> from said catalyst of said particulate filter to purify the released NO<sub>x</sub> by reduction so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame.

4. A device for purifying the exhaust gas of an internal combustion engine comprising:

a particulate filter arranged in the exhaust system, which carries a catalyst for absorbing and reducing NO<sub>x</sub>, said catalyst absorbing NO<sub>x</sub> when the air-fuel ratio in the

surrounding atmosphere thereof is lean and releasing the absorbed  $\text{NO}_x$  when said air-fuel ratio is stoichiometric or rich;

a catalytic apparatus for purifying  $\text{NO}_x$  arranged in the exhaust system upstream of said particulate filter, which catalytic apparatus carries a catalyst absorbing  $\text{NO}_x$  when the air-fuel ratio in the surrounding atmosphere thereof is lean and releasing the absorbed  $\text{NO}_x$  when said air-fuel ratio is stoichiometric or rich;

control means for making the air-fuel ratio in said catalytic apparatus rich to release  $\text{NO}_x$  from said catalyst of said catalytic apparatus to purify the released  $\text{NO}_x$  by reduction, and making the air-fuel ratio in the particulate filter rich to release  $\text{NO}_x$  from said catalyst of said particulate filter to purify the released  $\text{NO}_x$  by reduction so that said catalyst of said particulate filter also releases active-oxygen to oxidize and remove the particulates trapped on said particulate filter without producing luminous flame; and

bypassing means to make possible the exhaust gas bypass said particulate filter downstream said catalytic apparatus.

5. A device for purifying the exhaust gas of an internal combustion engine according to claim 4, wherein during the recovery process of the  $\text{SO}_x$  pollution of said catalytic apparatus, said bypassing means makes the exhaust gas bypass said particulate filter.

6. A device for purifying the exhaust gas of an internal combustion engine according to claim 4, wherein immediately after the finishing of the recovery process of the  $\text{SO}_x$  pollution of said catalytic apparatus, said bypassing means does not make the exhaust gas bypass said particulate filter and thus the exhaust gas passes through said particulate filter.

**APPENDIX B - EVIDENCE APPENDIX**

A copy of each of the following items of evidence relied on by the Appellant is  
attached:

NONE

**APPENDIX C - RELATED PROCEEDINGS APPENDIX**

Copies of relevant decisions in the following related proceedings are attached:

NONE